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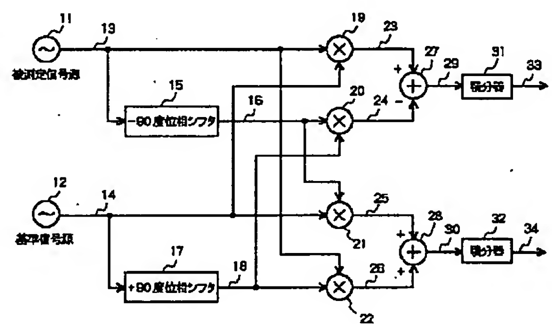
(54)【発明の名称】　直交検波器

(57)【要約】
【課題】　直交検波器において、フィルタを使用せずに和の信号を除去する。
【解決手段】　被測定信号源１１の出力信号１３と、基準信号源１２の出力信号１４は乗算器１９で、出力信号１３を－９０度位相シフトした信号１６と、出力信号１４を＋９０度位相シフトした信号１８は乗算器２０で、出力信号１６と１４は乗算器２１で、出力信号１３と１８は乗算器２２で乗算される。乗算器１９の出力信号２３と乗算器２０の出力信号２４の差信号が加算器２７で求められ、積分器３１に入力される。乗算器２１の出力信号２５と乗算器２２の出力信号２６の和信号が加算器２８で求められ、積分器３２に入力される。



【特許請求の範囲】

【請求項１】　被測定信号源の出力信号の位相を－９０度シフトする－９０度位相シフタと、
基準信号源の出力信号の位相を＋９０度シフトする＋９０度位相シフタと、
前記被測定信号源の出力信号と前記基準信号源の出力信号を乗算する第１の乗算器と、
前記－９０度位相シフタの出力信号と前記＋９０度位相シフタの出力信号を乗算する第２の乗算器と、
前記－９０度位相シフタの出力信号と前記基準信号源の出力信号を乗算する第３の乗算器と、
前記被測定信号源の出力信号と前記＋９０度位相シフタの出力信号を乗算する第４の乗算器と、
第１の乗算器の出力信号と第２の乗算器の出力信号の差信号を出力する第１の加算器と、
第３の乗算器の出力信号と第４の乗算器の出力信号の和信号を出力する第２の加算器と、
第１の加算器の出力信号を平均化する第１の積分器と、
第２の加算器の出力信号を平均化する第２の積分器を有する直交検波器。

【請求項２】　被測定信号源の出力信号の位相を－９０度シフトする第１の－９０度位相シフタと、
基準信号源の出力信号の位相を－９０度シフトする第２の－９０度位相シフタと、
前記被測定信号源の出力信号と前記基準信号源の出力信号を乗算する第１の乗算器と、
前記第１の－９０度位相シフタの出力信号と前記第２の－９０度位相シフタの出力信号を乗算する第２の乗算器と、
前記第１の－９０度位相シフタの出力信号と前記基準信号源の出力信号を乗算する第３の乗算器と、
前記被測定信号源の出力信号と前記第２の－９０度位相シフタの出力信号を乗算する第４の乗算器と、
第１の乗算器の出力信号と第２の乗算器の出力信号の和信号を出力する第１の加算器と、
第３の乗算器の出力信号と第４の乗算器の出力信号の差信号を出力する第２の加算器と、
第１の加算器の出力信号を平均化する第１の積分器と、
第２の加算器の出力信号を平均化する第２の積分器を有する直交検波器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、振幅、位相の測定に用いられる直交検波器に関する。

【０００２】

【従来の技術】図２は従来の直交検波器の構成図である。

【０００３】被測定信号源４１と同じ周波数の基準信号源４２がある。基準信号源４２の出力信号４４は、乗算器４７に入力される信号と、＋９０度位相シフタ４５によって＋９０度位相がシフトされた出力信号４６に分配される。

【０００４】被測定信号源４１の出力信号４３と、基準信号源４２の出力信号４４は、乗算器４７において乗算され、その出力信号４９は低域通過フィルタ５１を通過し、出力信号５３が積分器５５によって平均化されて、Ｉ信号５７となる。被測定信号源４１の出力信号４３と、＋９０度位相シフタ４５の出力信号４６は、乗算器４８において乗算され、その出力信号５０は低域通過フィルタ５２を通過し、出力信号５４が積分器５６によって平均化されて、Ｑ信号５８となる。

【０００５】基準信号源４２の出力信号４４に対する、被測定信号源４１の出力信号４３の位相をθとすると、位相θの変化に伴い、Ｉ信号５７はｃｏｓθ、Ｑ信号５８はｓｉｎθに比例した変化をする。したがって、θ＝ａｒｃｔａｎ（ｓｉｎθ／ｃｏｓθ）より、位相θを求めることができる。

【０００６】乗算器４７の出力信号４９には、信号４３と信号４４の周波数の和と差の信号が出力される。乗算器４８の出力信号５０には、信号４３と信号４６の周波数の和と差の信号が出力される。積分器５５、積分器５６で積分したい信号は、差の周波数の信号のみである。和の周波数の信号が積分器５５、積分器５６に入力されると、積分時間が和の周波数の信号の１周期の整数倍でない場合は、積分結果に誤差が生ずる。

【０００７】被測定信号源４１と基準信号源４２が、周波数の変化を伴う変調波の場合は、積分周期を和の周波数の１周期の整数倍にすることはほとんど不可能である。そこで、従来は、和の周波数の信号を除去するため、低域通過フィルタ５１と低域通過フィルタ５２が挿入されていた。

【０００８】ここで、パルス信号の振幅、位相を測定すると、Ｉ信号５７とＱ信号５８は立ち上がり、立ち下がりの急峻なパルス信号になる。低域通過フィルタ５１，５２を挿入すると、フィルタ５１，５２の時定数により、パルス立ち上がり、立ち下がりが緩やかになるなど、波形歪を生ずる。そのため、高速なパルス信号を測定することは困難であった。

【０００９】

【発明が解決しようとする課題】上述した従来の直交検波器は、乗算器で発生し、積分器に入力される高周波信号が積分誤差の原因となり、測定精度に影響を与えるという欠点があった。

【００１０】本発明の目的は、波形歪の原因となるフィルタを使用することなく、積分器に高周波信号が入力されないようにした直交検波器を提供することにある。

【００１１】

【課題を解決するための手段】本発明の直交検波器は、被測定信号源の出力信号の位相を－９０度シフトする－９０度位相シフタと、基準信号源の出力信号の位相を＋

９０度シフトする＋９０度位相シフタと、前記被測定信号源の出力信号と前記基準信号源の出力信号を乗算する第１の乗算器と、前記－９０度位相シフタの出力信号と前記＋９０度位相シフタの出力信号を乗算する第２の乗算器と、前記－９０度位相シフタの出力信号と前記基準信号源の出力信号を乗算する第３の乗算器と、前記被測定信号源の出力信号と前記＋９０度位相シフタの出力信号を乗算する第４の乗算器と、第１の乗算器の出力信号と第２の乗算器の出力信号の差信号を出力する第１の加算器と、第３の乗算器の出力信号と第４の乗算器の出力信号の和信号を出力する第２の加算器と、第１の加算器の出力信号を平均化する第１の積分器と、第２の加算器の出力信号を平均化する第２の積分器を有する。

【００１２】本発明の他の直交検波器は、被測定信号源の出力信号の位相を－９０度シフトする第１の－９０度位相シフタと、基準信号源の出力信号の位相を－９０度シフトする第２の－９０度位相シフタと、前記被測定信号源の出力信号と前記基準信号源の出力信号を乗算する第１の乗算器と、前記第１の－９０度位相シフタの出力信号と前記第２の－９０度位相シフタの出力信号を乗算する第２の乗算器と、前記第１の－９０度位相シフタの出力信号と前記基準信号源の出力信号を乗算する第３の乗算器と、前記被測定信号源の出力信号と前記第２の－９０度位相シフタの出力信号を乗算する第４の乗算器と、第１の乗算器の出力信号と第２の乗算器の出力信号の和信号を出力する第１の加算器と、第３の乗算器の出力信号と第４の乗算器の出力信号の差信号を出力する第２の加算器と、第１の加算器の出力信号を平均化する第１の積分器と、第２の加算器の出力信号を平均化する第２の積分器を有する。

【００１３】本発明は、直交検波器の乗算器出力に現れる、乗算器入力信号の周波数に対する差の信号と和の信号のうち、和の信号を除去する目的のために、三角関数の性質を利用して、差の信号を倍増し、和の信号を相殺するような信号を別に加えることにより、フィルタを使用せずに和の信号を除去し、波形歪の生じない、高速な＊パルス信号の直交検波を可能にするとともに、和の信号による積分誤差を除去することを可能にしたものである。

【００１４】

【発明の実施の形態】次に、本発明の実施の形態について図面を参照して説明する。

【００１５】図１は本発明の一実施形態の直交検波器の構成図である。

【００１６】本実施形態の直交検波器は、－９０度位相シフタ１５と、＋９０度位相シフタ１７と、乗算器１９，２０，２１，２２と、加算器２７，２８と、積分器３１，３２で構成されている。

【００１７】次に、本実施形態の動作を説明する。

【００１８】被測定信号源１１の出力信号１３は、乗算器１９に入力される信号１３と、－９０度位相シフタ１５によって－９０度位相がシフトされた出力信号１６に分配される。基準信号源１２の出力信号１４は、乗算器２１に入力される信号１４と、＋９０度位相シフタによって＋９０度位相がシフトされた出力信号１８に分配される。各信号を式で表すと、以下のようになる。

【００１９】

【数１】

$$\text{信号}13: s_{13}(t)=\cos(\omega t+\theta_m)$$
$$\text{信号}16: s_{16}(t)=\cos(\omega t+\theta_m-\pi/2)=\sin(\omega t+\theta_m)$$
$$\text{信号}14: s_{14}(t)=\cos(\omega t+\theta_r)$$
$$\text{信号}18: s_{18}(t)=\cos(\omega t+\theta_r+\pi/2)=-\sin(\omega t+\theta_r)$$

【００２０】信号１３と信号１４は、乗算器１９において乗算され、出力信号２３を得る。信号１６と信号１８は、乗算器２０において乗算され、出力信号２４を得る。信号２３と信号２４は、加算器２７において減算され、出力信号２９を得る。この処理過程を式で表すと、以下のようになる。

【００２１】

【数２】

$$\begin{aligned}\text{信号}23: s_{23}(t)&=s_{13}(t)\cdot s_{14}(t)\\&=\left[\cos(\theta_m-\theta_r)+\cos(2\omega t+\theta_m+\theta_r)\right]/2\\\text{信号}24: s_{24}(t)&=s_{16}(t)\cdot s_{18}(t)\\&=-\left[\cos(\theta_m-\theta_r)-\cos(2\omega t+\theta_m+\theta_r)\right]/2\\\text{信号}29: s_{29}(t)&=s_{23}(t)-s_{24}(t)=\cos(\theta_m-\theta_r)\end{aligned}$$

【００２２】信号１４と信号１６は、乗算器２１において乗算され、出力信号２５を得る。信号１３と信号１８は、乗算器２２において乗算され、出力信号２６を得る。信号２５と信号２６は、加算器２８において加算され、出力信号３０を得る。この処理過程を式で表すと、以下のようになる。

【００２３】

【数３】

$$
\begin{aligned}
\text{信号23}: s_{23}(t) &= s_{13}(t)\cdot s_{14}(t)\\
&= \left[\cos(\theta_m-\theta_r)+\cos(2\omega t+\theta_m+\theta_r)\right]/2\\
\text{信号24}: s_{24}(t) &= s_{16}(t)\cdot s_{18}(t)\\
&= -\left[\cos(\theta_m-\theta_r)-\cos(2\omega t+\theta_m+\theta_r)\right]/2\\
\text{信号29}: s_{29}(t) &= s_{23}(t)-s_{24}(t)=\cos(\theta_m-\theta_r)
\end{aligned}
$$

【００２４】乗算器１９，２０，２１，２２の出力信号２３，２４，２５，２６には信号源１１，１２の周波数の和、すなわち２ωの信号が含まれるが、加算器２７，２８における演算で２ωの信号は相殺され、加算器２７，２８の出力信号２９，３０には信号源１１，１２の周波数の差の信号のみが現れる。加算器２７の出力信号２９は積分器３１で平均化され、Ｉ信号３３となる。加算器２８の出力信号３０は積分器３２で平均化され、Ｑ信号３４となる。

【００２５】積分器３１，３２に入力される信号２９，３０には高周波信号が含まれないので、高周波信号による積分誤差は生じない。また、高周波信号の除去に低域通過フィルタを使用しないため、フィルタによるＩ信号３３、Ｑ信号３４への波形歪は生じない。

【００２６】図１の＋９０度位相シフタ１７は、９０度位相進みであるため、遅延素子での実現は不可能である。＋９０度位相シフタ１７を－９０度位相シフタに変更し、９０度位相遅れにすると、信号１８，２４，２６の振幅の符号が反転する。この場合、加算器２７における演算を、信号２３と信号２４の和に、また加算器２８における演算を、信号２５から信号２６を引く減算に変更することによって、変更前と同じ効果が得られる。

【００２７】

【発明の効果】以上説明したように、本発明は、三角関数の性質を利用して、差の信号を増幅し、和の信号を相殺するような信号を別に加えることにより、フィルタを＊使用せずに和の信号を除去し、波形歪の生じない、高速なパルス信号の直交検波が可能になる効果がある。

【図面の簡単な説明】

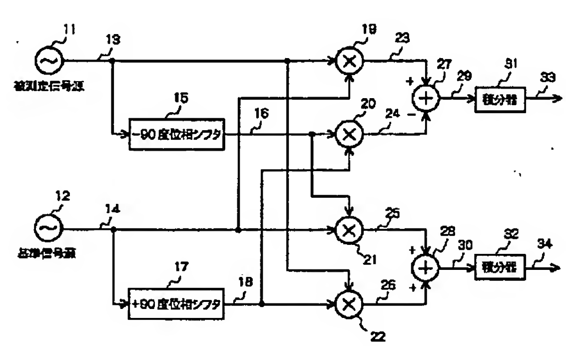
【図１】本発明の一実施形態の直交検波器の構成図である。

【図２】直交検波器の従来例の構成図である。

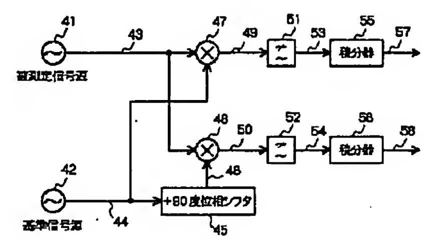
【符号の説明】

１１　被測定信号源
１２　基準信号源
１３　被測定信号源１１の出力信号
１４　基準信号源１２の出力信号
１５　－９０度位相シフタ
１６　－９０度位相シフタ１５の出力信号
１７　＋９０度位相シフタ
１８　＋９０度位相シフタ１７の出力信号
１９～２２　乗算器
２３　乗算器１９の出力信号
２４　乗算器２０の出力信号
２５　乗算器２１の出力信号
２６　乗算器２２の出力信号
２７，２８　加算器
２９　加算器２７の出力信号
３０　加算器２８の出力信号
３１，３２　積分器
３３　積分器３１の出力信号
３４　積分器３２の出力信号

【図１】



【図２】



【手続補正書】
【提出日】平成８年７月２２日
【手続補正１】
【補正対象書類名】明細書
【補正対象項目名】００２３
【補正方法】変更
【補正内容】
【００２３】
【数３】

$$\text{信号25：} s_{25}(t) = s_{14}(t) \cdot s_{16}(t) = \left[\sin(\theta_m - \theta_r) + \sin(2\omega t + \theta_m + \theta_r)\right]/2$$

$$\text{信号26：} s_{26}(t) = s_{13}(t) \cdot s_{18}(t) = \left[\sin(\theta_m - \theta_r) - \sin(2\omega t + \theta_m + \theta_r)\right]/2$$

$$\text{信号30：} s_{30}(t) = s_{25}(t) + s_{26}(t) = \sin(\theta_m - \theta_r)$$

CLAIMS

[Claim(s)]

[Claim 1] About -90 degrees which shifts the phase of the output signal of the source of a measurement signal-ed -90 degrees A phase shifter, About +90 degrees which shifts the phase of the output signal of the source of a reference signal +90 degrees A phase shifter, The 1st multiplier which carries out the multiplication of the output signal of said source of a measurement signal-ed, and the output signal of said source of a reference signal, The aforementioned output signal of a phase shifter and the 2nd aforementioned multiplier of the above which carries out the multiplication of the output signal of a phase shifter about +90 degrees about -90 degrees, The 3rd multiplier of the above which carries out the multiplication of the output signal of a phase shifter, and the output signal of said source of a reference signal about -90 degrees, The output signal of said source of a measurement signal-ed, and the 4th multiplier of the above which carries out the multiplication of the output signal of a phase shifter about +90 degrees, The 1st adder which outputs the difference signal of the output signal of the 1st multiplier, and the output signal of the 2nd multiplier, The rectangular wave detector which has the 2nd adder which outputs the sum signal of the output signal of the 3rd multiplier, and the output signal of the 4th multiplier, the 1st integrator which equalizes the output signal of the 1st adder, and the 2nd integrator which equalizes the output signal of the 2nd adder.

[Claim 2] The one to 90th [about] degree which shifts the phase of the output signal of the source of a measurement signal-ed -90 degrees A phase shifter, The two to 90th [about] degree which shifts the phase of the output signal of the source of a reference signal -90 degrees A phase shifter, The 1st multiplier which carries out the multiplication of the output signal of said source of a measurement signal-ed, and the output signal of said source of a reference signal, Said said 2nd multiplier which carries out the multiplication of the output signal of a phase shifter to the output signal of a phase shifter the two to 90th [about] degree the one to 90th [about] degree, Said 3rd multiplier which carries out the multiplication of the output signal of a phase shifter, and the output signal of said source of a reference signal the one to 90th [about] degree, Said 4th multiplier which carries out the multiplication of the output signal of a phase shifter to the output signal of said source of a measurement signal-ed the two to 90th [about] degree, The 1st adder which outputs the sum signal of the output signal of the 1st multiplier, and the output signal of the 2nd multiplier, The rectangular wave detector which has the 2nd adder which outputs the difference signal of the output signal of the 3rd multiplier, and the output signal of the 4th multiplier, the 1st integrator which equalizes the output signal of the 1st adder, and the 2nd integrator which equalizes the output signal of the 2nd adder.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the rectangular wave detector used for measurement of the amplitude and a phase.
[0002]
[Description of the Prior Art] Drawing 2 is the block diagram of the conventional rectangular wave detector.
[0003] There is a source 42 of a reference signal of the same frequency as the source 41 of a measurement signal-ed. The output signal 44 of the source 42 of a reference signal is distributed to the signal inputted into a multiplier 47, and the output signal 46 with which the phase was shifted by the phase shifter 45 about +90 degrees about +90 degrees.
[0004] In a multiplier 47, the multiplication of the output signal 43 of the source 41 of a measurement signal-ed and the output signal 44 of the source 42 of a reference signal is carried out, the output signal 49 passes a low pass filter 51, an output signal 53 is equalized by the integrator 55, and they turn into I signal 57. The output signal 43 of the source 41 of a measurement signal-ed, and about +90 degrees, in a multiplier 48, the multiplication of the output signal 46 of the phase shifter 45 is carried out, the output signal 50 passes a low pass filter 52, an output signal 54 is equalized by the integrator 56, and it turns into Q signal 58.
[0005] If the phase of the output signal 43 of the source 41 of a measurement signal-ed to the output signal 44 of the source 42 of a reference signal is set to theta, change in which I signal 57 was proportional to costheta, and Q signal 58 is proportional to sintheta will be carried out with change of a phase theta. Therefore, it can ask for a phase theta from theta=arctan (sintheta/costheta).
[0006] The sum of the frequency of a signal 43 and a signal 44 and the signal of a difference are outputted to the output signal 49 of a multiplier 47. The sum of the frequency of a signal 43 and a signal 46 and the signal of a difference are outputted to the output signal 50 of a multiplier 48. A signal to integrate an integrator 55 and an integrator 56 is only a signal of the frequency of a difference. If the signal of a peace frequency is inputted into an integrator 55 and an integrator 56, when the reset time is not the integral multiple of one period of the signal of a peace frequency, an error arises in an integral result.
[0007] In the case of the modulated wave accompanied by change of a frequency in the source 41 of a measurement signal-ed, and the source 42 of a reference signal, it is almost impossible for making an integral period into the integral multiple of one period of a peace frequency. Then, in order to remove the signal of a peace frequency conventionally, the low pass filter 51 and the low pass filter 52 were inserted.
[0008] Here, if the amplitude of a pulse signal and a phase are measured, I signal 57 and Q signal 58 will start, and will turn into a steep pulse signal of falling. Insertion of low pass filters 51 and 52 produces waveform distortion with the time constant of filters 51 and 52 -- a pulse standup and falling become loose. Therefore, it was difficult to measure a high-speed pulse signal.
[0009]
[Problem(s) to be Solved by the Invention] It generated with the multiplier, the RF signal inputted into an integrator caused an integral error, and the conventional rectangular wave detector mentioned above had the fault of affecting the accuracy of measurement.
[0010] The object of this invention is to offer the rectangular wave detector which the RF signal was made not to be inputted into an integrator, without using the filter leading to waveform distortion.
[0011]
[Means for Solving the Problem] The rectangular wave detector of this invention about -90 degrees which shifts the phase of the output signal of the source of a measurement signal-ed -90 degrees A phase shifter, About +90 degrees which shifts the phase of the output signal of the source of a reference signal +90 degrees A phase shifter, The 1st multiplier which carries out the multiplication of the output signal of said source of a

measurement signal-ed, and the output signal of said source of a reference signal, The aforementioned output signal of a phase shifter and the 2nd aforementioned multiplier of the above which carries out the multiplication of the output signal of a phase shifter about +90 degrees about -90 degrees, The 3rd multiplier of the above which carries out the multiplication of the output signal of a phase shifter, and the output signal of said source of a reference signal about -90 degrees, The output signal of said source of a measurement signal-ed, and the 4th multiplier of the above which carries out the multiplication of the output signal of a phase shifter about +90 degrees, The 1st adder which outputs the difference signal of the output signal of the 1st multiplier, and the output signal of the 2nd multiplier, It has the 2nd adder which outputs the sum signal of the output signal of the 3rd multiplier, and the output signal of the 4th multiplier, the 1st integrator which equalizes the output signal of the 1st adder, and the 2nd integrator which equalizes the output signal of the 2nd adder.
[0012] Other rectangular wave detectors of this invention the one to 90th [about] degree which shifts the phase of the output signal of the source of a measurement signal-ed -90 degrees A phase shifter, The two to 90th [about] degree which shifts the phase of the output signal of the source of a reference signal -90 degrees A phase shifter, The 1st multiplier which carries out the multiplication of the output signal of said source of a measurement signal-ed, and the output signal of said source of a reference signal, Said said 2nd multiplier which carries out the multiplication of the output signal of a phase shifter to the output signal of a phase shifter the two to 90th [about] degree the one to 90th [about] degree, Said 3rd multiplier which carries out the multiplication of the output signal of a phase shifter, and the output signal of said source of a reference signal the one to 90th [about] degree, Said 4th multiplier which carries out the multiplication of the output signal of a phase shifter to the output signal of said source of a measurement signal-ed the two to 90th [about] degree, The 1st adder which outputs the sum signal of the output signal of the 1st multiplier, and the output signal of the 2nd multiplier, It has the 2nd adder which outputs the difference signal of the output signal of the 3rd multiplier, and the output signal of the 4th multiplier, the 1st integrator which equalizes the output signal of the 1st adder, and the 2nd integrator which equalizes the output signal of the 2nd adder.
[0013] This invention for the object which removes the signal of the difference over the frequency of the multiplier input signal which appears in the multiplier output of a rectangular wave detector, and the signal of the sum among peace signals While enabling rectangular detection of a high-speed pulse signal which doubles the signal of a difference, and removes a peace signal using the property of a trigonometric function, without using a filter by adding independently a signal which offsets a peace signal, and waveform distortion does not produce It makes it possible to remove the integral error by the peace signal.
[0014]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to a drawing.
[0015] Drawing 1 is the block diagram of the rectangular wave detector of 1 operation gestalt of this invention.
[0016] The rectangular wave detector of this operation gestalt consists of the phase shifter 17, multipliers 19, 20, 21, and 22, adders 27 and 28, and integrators 31 and 32 about +90 degrees with the phase shifter 15 about -90 degrees.
[0017] Next, actuation of this operation gestalt is explained.
[0018] At least -90 degree is distributed at least for -90 phase shifters to the output signal 16 with which the phase was shifted by 15 with the signal 13 with which the output signal 13 of the source 11 of a measurement signal-ed is inputted into a multiplier 19. The output signal 14 of the source 12 of a reference signal is distributed to the signal 14 inputted into a multiplier 21, and the output signal 18 with which the phase was shifted by the phase shifter about +90 degrees about +90 degrees. It is as follows when each signal is expressed with a formula.
[0019]
[Equation 1]
信号13 : $s_{13}(t)=\cos(\omega t+\theta_m)$
信号16 : $s_{16}(t)=\cos(\omega t+\theta_m-\pi/2)=\sin(\omega t+\theta_m)$
信号14 : $s_{14}(t)=\cos(\omega t+\theta_r)$
信号18 : $s_{18}(t)=\cos(\omega t+\theta_r+\pi/2)=-\sin(\omega t+\theta_r)$

[0020] In a multiplier 19, the multiplication of a signal 13 and the signal 14 is carried out, and they acquire an output signal 23. In a multiplier 20, the multiplication of a signal 16 and the signal 18 is carried out, and they acquire an output signal 24. A signal 23 and a signal 24 are subtracted in an adder 27, and acquire an output signal 29. It is as follows when this processing process is expressed with a formula.
[0021]
[Equation 2]

信号23 : $s_{23}(t)=s_{13}(t)\cdot s_{14}(t)$
$=\left[\cos(\theta_m-\theta_r)+\cos(2\omega t+\theta_m+\theta_r)\right]/2$
信号24 : $s_{24}(t)=s_{16}(t)\cdot s_{18}(t)$
$=-\left[\cos(\theta_m-\theta_r)-\cos(2\omega t+\theta_m+\theta_r)\right]/2$
信号29 : $s_{29}(t)=s_{23}(t)-s_{24}(t)=\cos(\theta_m-\theta_r)$

[0022] In a multiplier 21, the multiplication of a signal 14 and the signal 16 is carried out, and they acquire an output signal 25. In a multiplier 22, the multiplication of a signal 13 and the signal 18 is carried out, and they acquire an output signal 26. A signal 25 and a signal 26 are added in an adder 28, and acquire an output signal 30. It is as follows when this processing process is expressed with a formula.
[0023]
[Equation 3]
信号23 : $s_{23}(t)=s_{13}(t)\cdot s_{14}(t)$
$=\left[\cos(\theta_m-\theta_r)+\cos(2\omega t+\theta_m+\theta_r)\right]/2$
信号24 : $s_{24}(t)=s_{16}(t)\cdot s_{18}(t)$
$=-\left[\cos(\theta_m-\theta_r)-\cos(2\omega t+\theta_m+\theta_r)\right]/2$
信号29 : $s_{29}(t)=s_{23}(t)-s_{24}(t)=\cos(\theta_m-\theta_r)$

[0024] Although the sum of the frequency of the sources 11 and 12 of a signal, i.e., a 2omega signal, is contained in the output signals 23, 24, 25, and 26 of multipliers 19, 20, 21, and 22, a 2omega signal is offset by the operation in adders 27 and 28, and only the signal of the difference of the frequency of the sources 11 and 12 of a signal appears in the output signals 29 and 30 of adders 27 and 28. The output signal 29 of an adder 27 is equalized with an integrator 31, and turns into I signal 33. The output signal 30 of an adder 28 is equalized with an integrator 32, and turns into Q signal 34.
[0025] Since a RF signal is not included in the signals 29 and 30 inputted into integrators 31 and 32, the integral error by the RF signal is not produced. Moreover, in order not to use a low pass filter for clearance of a RF signal, the waveform distortion to I signal 33 with a filter and Q signal 34 is not produced.
[0026] About +90 degrees of drawing 1 , about 90 degrees, since the phase shifter 17 is phase progress, it is impossible for the implementation by the delay element. + If at least -90 phase shifters change 17 into a phase shifter and are made into phase delay about 90 degrees about 90 degrees, the sign of the amplitude of signals 18, 24, and 26 will be reversed. In this case, the same effectiveness as modification before is acquired by changing an operation [in / for the operation in an adder 27 / an adder 28] into subtraction which lengthens a signal 26 from a signal 25 again at the sum of a signal 23 and a signal 24.
[0027]
[Effect of the Invention] As explained above, by amplifying the signal of a difference and adding independently a signal which offsets a peace signal using the property of a trigonometric function, this invention removes a peace signal, without using a filter, and is effective in rectangular detection of a high-speed pulse signal which waveform distortion does not produce being attained.

[Translation done.]

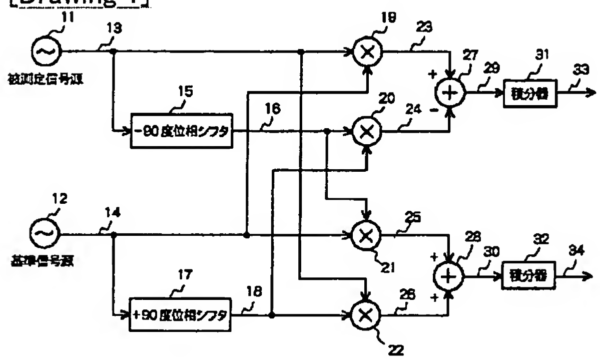
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the rectangular wave detector of 1 operation gestalt of this invention.
[Drawing 2] It is the block diagram of the conventional example of a rectangular wave detector.
[Description of Notations]
11 Source of Measurement Signal-ed
12 Source of Reference Signal
13 Output Signal of Source 11 of Measurement Signal-ed
14 Output Signal of Source 12 of Reference Signal
15 It is Phase Shifter about -90 Degrees.
16 It is Output Signal of Phase Shifter 15 about -90 Degrees.
17 It is Phase Shifter about +90 Degrees.
18 It is Output Signal of Phase Shifter 17 about +90 Degrees.
19-22 Multiplier
23 Output Signal of Multiplier 19
24 Output Signal of Multiplier 20
25 Output Signal of Multiplier 21
26 Output Signal of Multiplier 22
27 28 Adder
29 Output Signal of Adder 27
30 Output Signal of Adder 28
31 32 Integrator
33 Output Signal of Integrator 31
34 Output Signal of Integrator 32

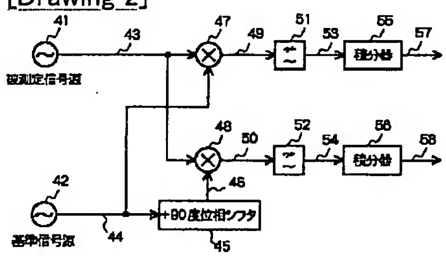
[Translation done.]

DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]